

3419-20

INFRARED THERMO HiTESTER

INSTRUCTION MANUAL

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HIOKI

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Introduction

Thank you for purchasing the HIOKI “Model 3419-20 INFRARED THERMO HiTESTER.” To obtain maximum performance from the instrument, please read this manual first, and keep it handy for future reference.

Overview

The Model 3419-20 is a non-contact thermometer using infrared rays. It can measure the surface temperature of an object by measuring the energy level of the infrared rays emitted from the object without touching it.

- Liquid crystal display with backlight
- Laser marker beams
- Thermal emissivity setting function
- Display and sound alarm functions
- Measurement value saving function

Inspection and Maintenance

Initial Inspection

When you receive the instrument, inspect it carefully to ensure that no damage occurred during shipping. In particular, check the accessories, the liquid crystal display, the control keys, and the lens. If damage is evident, or if it fails to operate according to the specifications, contact your dealer or Hioki representative.

Maintenance and Service

- To clean the instrument, wipe it gently with a soft cloth moistened with water or mild detergent. Never use solvents such as benzene, alcohol, acetone, ether, ketones, thinners or gasoline, as they can deform and discolor the case.
- If the instrument seems to be malfunctioning, confirm that the battery are not discharged before contacting your dealer or Hioki representative.
- Pack the instrument so that it will not sustain damage during shipping, and include a description of existing damage. We do not take any responsibility for damage incurred during shipping.

Safety

WARNING

Mishandling this instrument during use could result in injury or death, as well as damage to the instrument. Be certain that you understand the instructions and precautions in the manual before use. We disclaim any responsibility for accidents or injuries not resulting directly from instrument defects.

This manual contains information and warnings essential for safe operation of the instrument and for maintaining it in safe operating condition. Before using it, be sure to carefully read the following safety precautions.

Safety Symbol

	In the manual, the  symbol indicates particularly important information that the user should read before using the instrument.
	Indicates warnings relating to the laser.

Symbols for Various Standards

	WEEE marking: This symbol indicates that the electrical and electronic appliance is put on the EU market after August 13, 2005, and producers of the Member States are required to display it on the appliance under Article 11.2 of Directive 2002/96/EC (WEEE).
	This symbol indicates that the product conforms to safety regulations set out by the EC Directive.

The following symbols in this manual indicate the relative importance of cautions and warnings.

	Indicates that incorrect operation presents an extreme hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a significant hazard that could result in serious injury or death to the user.
	Indicates that incorrect operation presents a possibility of injury to the user or damage to the device.
	Indicates advisory items related to performance or correct operation of the instrument.

Usage Notes

Follow these precautions to ensure safe operation and to obtain the full benefits of the various functions.

Preliminary Checks

Before using the instrument the first time, verify that it operates normally to ensure that the no damage occurred during storage or shipping. If you find any damage, contact your dealer or Hioki representative.

DANGER

Do not allow the laser light beam to impinge upon any gas which can explode.

CAUTION

- Use of controls or adjustments or performance of procedures other than those specified herein may result in hazardous radiation exposure.
- The Model 3419-20 uses as a light source a semiconductor laser which emits visible light, and which conforms to IEC standard class 2 (IEC 60825-1). (Wavelength 650nm, maximum power output 1 mW) Since there is considerable danger of this laser light causing damage to the eyes, be very careful not to direct this laser light into your eyes or those of another person.
- Do not look directly into the laser light from the optical system.
- When measuring the temperature of an object which has a mirror finish, be careful not to allow the laser light beam to be reflected off the surface into your eyes or those of another person.
- This instrument should be installed and operated indoors only, between 0 and 50°C and 80% RH or less.
- Do not store or use the instrument where it could be exposed to direct sunlight, high temperature or humidity, or condensation. Under such conditions, the instrument may be damaged and insulation may deteriorate so that it no longer meets specifications.
- This instrument is not designed to be entirely water- or dust-proof. Do not use it in an especially dusty environment, nor where it might be splashed with liquid. This may cause damage.

CAUTION

- Do not use the instrument where it may be exposed to corrosive or combustible gases. The instrument may be damaged.
- Do not use the instrument near a source of strong electromagnetic radiation, or near a highly electrically charged object. These may cause a malfunction.
- To avoid damage to the instrument, protect it from physical shock when transporting and handling. Be especially careful to avoid physical shock from dropping.
- Do not point the lens at the sun or at any other source of strong light. If you do, the sensor may be damaged.
- Do not contact the lens against the object whose temperature is to be measured, or get it dirty, allow it to be scratched, or allow any foreign material to adhere to it. Doing so may cause errors.

Specifications

Basic Specifications

Function	Infrared temperature measurement
Additional Function	MAX/MIN display, Alarm function, Backlight function, Memory function
Power supply	6F22 manganese battery × 1 or 6LR61 alkaline battery × 1
Dimensions	Approx. 46 W × 172 H × 118 D mm (1.81"W × 6.77"H × 4.65"D)(excluding projections)
Mass	Approx. 220 g (7.8 oz.) (including manganese battery × 1)
Location for use	Indoors, altitude up to 2000 m (6562-ft.)
Operating temperature and humidity	0 to 50°C (32°F to 122°F), 80%RH or less (non-condensating)
Storage temperature and humidity	-10 to 50°C (14°F to 122°F), 80%RH or less (non-condensating) 50 to 60°C (122°F to 140°F), 70%RH or less (non-condensating)
Accessories	Instruction manual, 6F22 manganese battery × 1 Carrying case × 1
Options	Black body tape
Effect of radiated radio-frequency electromagnetic field	±70°C at 3 V/m
Applicable standards EMC	EN61326
Laser	IEC60825-1:1993+A1:1997+A2:2001 CLASS 2 LASER This product is complied with 21 CFR 1040.10 and 1040.11 except for deviations pursuant to Laser Notice No.50, dated June 24,2007

General

Rated supply voltage	9VDC × 1
Maximum rated powers	550 mVA
Continuous operating time	Approx. 55 hours (manganese battery), Approx. 80 hours (alkaline battery), When laser marker and backlight are OFF
Auto Power Off	Approx. 15 seconds

Electrical characteristics

Detection element	Thermopile
Temperature units	°C, °F
Measurement temperature range	-35 to 500°C (-31 to 932°F)
Display resolution	0.1°C (0.2°F)
Accuracy	-35.0 to -0.1°C (-31.0 to 31.9°F): ±10%rdg. ±2°C (±(T-32)×0.1±4°F T = reading value (°F)) 0.0 to 500.0°C (32.0 to 932.0°F): ±2%rdg. or ±2°C (4°F) whichever value is higher. (except when battery mark is flash)
Guaranteed accuracy period	1 year
Accuracy guarantee for temperature and humidity	23°C ±5°C (73°F ±9°F), 80%RH or less (non-condensating)
Temperature coefficient	Measurement accuracy × 0.1/ °C
Display revise	2 times/ second
Measurement wavelength	6 to 14 μm
Diameter of field of measurement	125 mm at 1000 mm (D:S=8:1)
Thermal emissivity compensation	0.17 to 1.00 by steps of 0.01
Sighting	Laser marker 1 mW (MAX), Red

Accuracy

rdg. :reading value (The value currently being measured and indicated on the measuring instrument)

Replacing Battery

DANGER

When replacing the battery, be careful not to accidentally pull the measuring trigger key. This may cause the laser marker to enter the eyes and is extremely dangerous. After exchanging the battery, be sure to close the cover before using the instrument.

WARNING

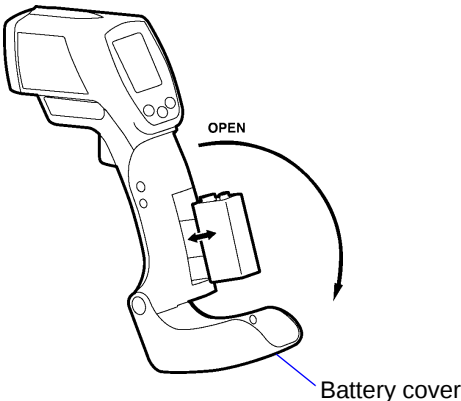
- **Be sure to insert them with the correct polarity. Otherwise, poor performance or damage from battery leakage could result. Replace battery only with the specified type.**
- **Battery may explode if mistreated. Do not short-circuit, recharge, disassemble or dispose of in fire.**
- **Handle and dispose of battery in accordance with local regulations.**

CAUTION

Take care not to get the cable caught in the battery cover as this may break it.

NOTE

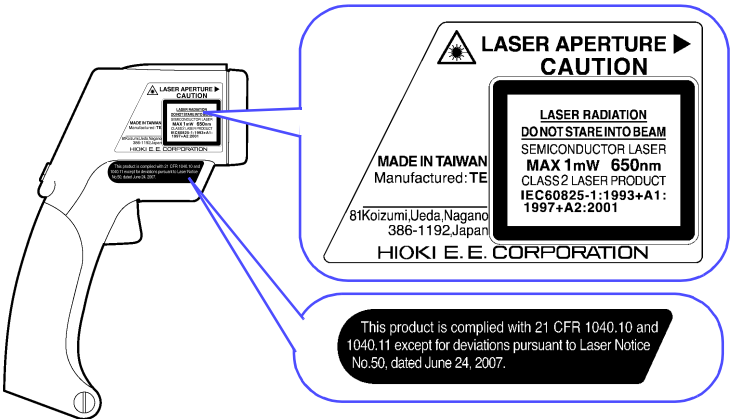
The  lights up when the remaining battery capacity is low. In this case, the instrument's reliability is not guaranteed. Replace the battery immediately.



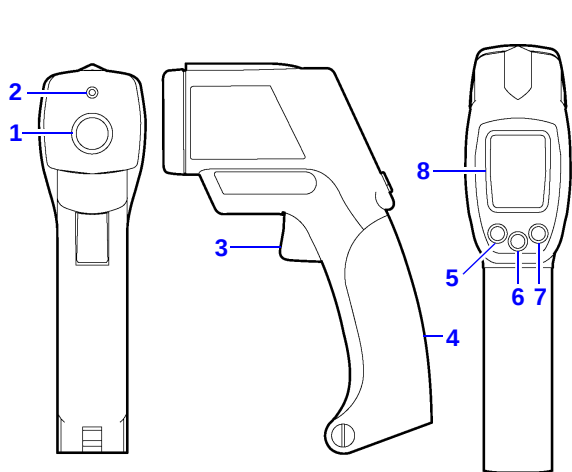
1. Open the battery cover and take out the battery.
2. Change the battery, while being sure to put them in the right way round.
3. Put the battery in the case and close the battery cover.

Warning Labels

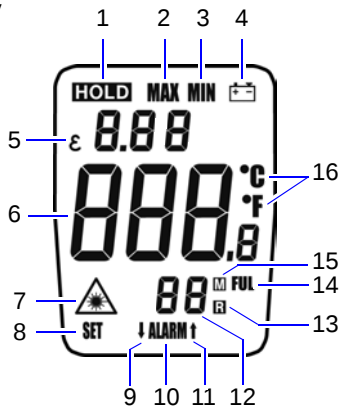
Location of labels used in the HIOKI “3419-20 INFRARED THERMO HiTESTER” are as follows.



Names and Function of Parts



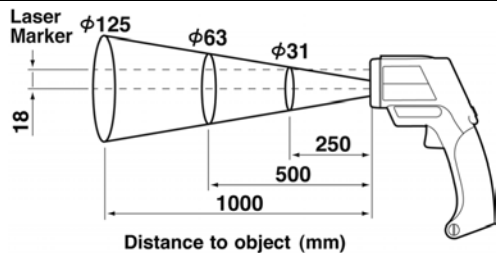
8. Display



Measurement



Whenever the indication  is blinking, the laser marker beam is being emitted. Exercise extreme care not to allow the laser marker beam to enter your eyes or those of another person. Because of this laser light causing damage to the eyes.



NOTE

- The center of the measurement range and the points indicated by the laser markers are off by 18 mm.
- The object whose temperature is to be measured needs to be larger than the measurement diameter by an adequate margin.
- Consecutive measurements are carried out by pulling and holding the measuring trigger key. Measurement will stop when the measuring trigger key is released and the last shown value will be retained.
- The instrument will automatically switch off approximately 15 seconds after the measuring trigger key is released.

1. Lens

Infrared rays from the object whose temperature is to be measured are received here.

2. Laser marker beam emission openings

The laser marker beams are emitted from here.

3. Measuring trigger key

- Pull the trigger to switch on the power to start measuring.
- The instrument will confirm the settings at SET mode and then return to Measuring mode. (After switching the display, the measurement value shown before setting the SET mode will be displayed.)

4. Battery cover

Key		Press one time	Press and hold 2 seconds
5	 	• Turns the backlight ON/OFF during measurement. • Memory No. decreases during Memory Retrieval mode. • Setting value decreases during SET mode.	Saves measurement values (MAX/MIN values are not saved).
6	MODE	• Activates MAX/MIN Measuring mode. • Each press of the key changes the setting from MAX → MIN → Current Value.	Activates SET mode. You can set alarm and thermal emissivity.
7	 	• Turns the laser markers to be reflected ON/OFF during measurement. • Memory No. increases during Memory Retrieval mode. • Setting value increases during SET mode.	Activates Memory Retrieval mode. You can retrieve saved values.

- Indicates that the measurement value is being maintained.
- Indicates the maximum value.
- Indicates the minimum value.
- Indicates the battery consumption level (refer to Replacing Battery)
- Indicates the thermal emissivity. This lamp will blink when the  indicator appears.
- Indicates the measurement value. This lamp will blink when the  indicator appears.
- Indicates the lit setting for laser marker. (When this lamp is off, the laser maker beam is not emitted) This lamp will blink when the laser marker beam is being emitted during lit setting.
- Indicates that the SET mode is activated.
- Light indicating temperature is below minimum temperature for alarm setting.
- Indicates that alarm setting is activated.
- Light indicating temperature is above maximum temperature for alarm setting.
- Indicates the Memory No. of saved data.
- Indicates Memory Retrieval Mode.
- Indicates the Memory full.
- Indicates that the store data to memory.
- Indicates the temperature units.

1. Turning the Power On

With the power switch at OFF, pull the measuring trigger key to switch on the power to start measuring.

2. °C/°F Setting

- When the **MODE** key is pressed and held for 2 seconds or more, “SET” will be shown on the left bottom of the display and the SET mode will be activated.
- In the SET mode, press the **MODE** key 4 times to display the “°C” or “°F”.
- Press the ▼▲ keys to set the unit of measurement.
- When the setting is completed, pull the measuring trigger key to return to the Measuring mode.

3. Thermal emissivity setting

- When the **MODE** key is pressed and held for 2 seconds or more, “SET” will be shown on the display and the SET mode will be activated.
- In the SET mode, press the **MODE** key 3 times to display the “ε” sign.
- Press the keys to set thermal emissivity.
- When the setting is completed, pull the measuring trigger key to return to the Measuring mode.
- Refer to the section on thermal emissivity for thermal emissivity setting.

4. Measuring

Direct the lens toward the object whose temperature is to be measured.

MAX/MIN Measurement

- When the **MODE** key is pressed once during measurement, “**MAX**” will be shown on the display and the maximum value achieved since the start of the measurement will be shown.
- When the **MODE** key is pressed once after MAX is displayed, “**MIN**” will be shown on the display and the minimum value achieved since the start of the measurement will be shown.
- When the **MODE** key is pressed once after MIN is displayed, the current value will be shown. The MAX/MIN values will be retained until the instrument is switched off. (The MAX/MIN values will be reset when the power is turned off)

Setting the Functions

- Pull the measuring trigger key to switch on the power.
- When the **MODE** key is pressed and held for 2 seconds or more, “**SET**” will be shown on the display and the SET mode will be activated.
- Each press of the key changes the setting as follows:
ON/OFF alarm setting → **lower value setting for the alarm** → **upper value setting for the alarm** → **thermal emissivity** → **°C/°F setting** → **ON/OFF alarm setting**
- When the setting is completed, pull the measuring trigger key to return to the Measuring mode.
- Refer to the Measurement section on how to carry out the various settings.

NOTE

- Settings are retained even after the power is switched off.
- Backlight function and memory retrieval function are not available in the SET mode.

Alarm Function

The alarm can be set to go off whenever a value which is higher or lower than a threshold value inputted beforehand is reached. The alarm is in the form of a display and a buzzer.

- Pull the measuring trigger key to switch on the power.
- When the **MODE** key is pressed and held for 2 seconds or more, the SET mode is activated.
“SET”, “↓ALARM↑”, “on” or “oFF” will be shown on the display.
- Set the alarm to “on” by pressing the ▼▲ keys.
- Press the **MODE** key to display the “↓ALARM” (minimum alarm value) sign. Press the ▼▲ keys to set the minimum temperature for the alarm.
- Press the **MODE** key to display the “ALARM↑” (maximum alarm value) sign. Press the ▼▲ keys to set the maximum temperature for the alarm.
- When the setting is completed, pull the measuring trigger key to return to the Measuring mode.

Saving, Retrieving and Deleting Measurement Values

Saving

You can save up to 50 data.

When the  key is pressed and held for 2 seconds or more while the measurement value is retained, the Memory No. and  will be shown on the display and the value will be saved.

NOTE

When saved data exceeds 50, “FUL” will be shown on the right bottom of the display and further values will not be saved.

Retrieving (Memory Retrieving mode)

When the  key is pressed and held for 2 seconds or more, the Memory No. and  will be shown on the display and the saved value will be shown. Pressing the ▼▲ keys changes the Memory No. being referred to. To return to the normal Measuring mode, press the measuring trigger key or **MODE** key.

NOTE

The auto power off time for memory retrieval is approximately 3 minutes.

Deleting

Pulling the measuring trigger key and pressing the  key at the same time when the instrument is not switched on will cause “CLR” to appear on the display and all data to be deleted.

Thermal Emissivity

This instrument allows thermal emissivity to be adjusted within the range of 0.17 to 1.00.

Please refer to the following table when setting the thermal emissivity.

Refractory & Building Materials		Metal	
Alumina (coarse grain)	0.45	Aluminum (heavily oxidized)	0.25
Alumina (fine grain)	0.25	Aluminum Alloys various	0.10 to 0.25
Asbestos	0.95	Aluminum oxide at 260°C	0.60
Carbon (graphite)	0.75	Aluminum oxide at 800°C	0.30
Carbon (soot)	0.95	Brass (oxidized)	0.60
Carborundum (Trademark)	0.85	Brass (polished)	0.10
Concrete	0.7	Brass (roughened surface)	0.20
Fire clay	0.75	Cast iron (polished)	0.20
Marble	0.90	Cast iron (rough) rusted	0.95
Plaster	0.90	Cast iron (turned at 100°C)	0.45
Quartz (rough)	0.90	Cast iron (turned at 1000°C)	0.60 to 0.70
Red brick (rough)	0.75 to 0.90	Copper (oxidized)	0.80
Silica (coarse grain)	0.55	Copper (polished)	0.05
Silica (fine grain)	0.40	Iron plate(rusted)	0.70 to 0.85
Timber (various)	0.80 to 0.90	Lead (oxidized at 25°C)	0.30
Zirconium silicate at 850°C	0.60	Lead (oxidized at 200°C)	0.60
Zirconium silicate up to 500°C	0.85	Lead (pure)	0.10
Miscellaneous		Mild steel	0.30 to 0.50
Aluminum lacquer	0.50	Molten cast iron	0.30
Enamel (any color)	0.90	Molten copper	0.15
Lacquer	0.90	Nichrome	0.70
Matte black paint	0.95 to 0.98	Nichrome (oxidized)	0.95
Oil paint (any color)	0.95	Nickel (pure)	0.10
Paper and cardboard	0.90	Nickel plate (oxidized)	0.40 to 0.50
Plastics	0.80 to 0.95	Polished aluminum	0.10
Plastics films (0.05 mm thick)	0.50 to 0.95	Rough ingot iron	0.90
Polythene film (0.03 mm thick)	0.20 to 0.30	Stainless steel (polished)	0.10
Rubber (rough)	0.98	Stainless steel (various)	0.20 to 0.60
Rubber (smooth)	0.90	Steel	0.60
Silicone polish	0.70	Steel plate (oxidized)	0.90
Water	0.98		

NOTE

- Variations in the surface condition and color of the object whose temperature is to be measured may cause the thermal emissivity ε to be somewhat different from the values in the above table. If an accurate temperature measurement is desired for an object whose thermal emissivity is not known, black body tape (sold separately) should be used. In this case the setting for thermal emissivity (ε) should be the value indicated on black body tape.
- Iron and other objects with low thermal emissivity reflect their surrounding temperature, causing inaccuracies in measurement. The black body tape (sold separately) are also recommended when measuring these objects of low thermal emissivity.